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APPLICATION NUMBER: *60/544,938*
FILING DATE: *February 13, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/04309*

Certified by

Jon W. Dudas

Under Secretary of Commerce
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PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2).

Docket Number	60,437-016	Type plus sign (+) inside this box ▸▸	+

INVENTOR(S)/APPLICANT(S)

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LIGHT WEIGHT NOISE ABSORPTION SYSTEM

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ENCLOSED APPLICATION PARTS (*check all that apply*)

☒ Specification — *Number of Pages* 9
☒ Drawing(s) — *Number of Sheets* 3
_____ This applicant claims entitlement to Small Entity Status
Other (specify) _____

METHOD OF PAYMENT (*check one*)

☒ A check or money order is enclosed to cover the Provisional filing fees
☒ The Commissioner is hereby authorized to charge any filing fee deficiencies and credit any overpayments to Deposit Account Number: **08-2789**

PROVISIONAL FILING FEE AMOUNT
($) 160.00

CUSTOMER NO. 27305

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,
SIGNATURE _____
TYPED or PRINTED NAME Gregory D. DeGrazia

Date February 13, 2004
REGISTRATION NO 48,944
(*if appropriate*)

☐ Additional inventors are being named on separately numbered sheets attached hereto

PROVISIONAL APPLICATION FILING ONLY

CERTIFICATE OF EXPRESS MAILING

I hereby certify that the enclosed **PROVISIONAL PATENT APPLICATION** and fee are being deposited with the United States Postal Service as Express Mail, postage prepaid, in an envelope as "Express Mail Post Office to Addressee", Mailing Label No. **EL998311083US** and addressed to Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on **February 13, 2004.**

Tracy L. Smith

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PTO/SB/17 (05-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2004

Patent fees are subject to annual revision.

☐ *Applicant Claims small entity status. See 37 CFR 1.27*

TOTAL AMOUNT OF PAYMENT ($) 160

Complete if Known	
Application Number	Herewith
Filing Date	February 13, 2004
First Named Inventor	Steven G. Brown, et al.
Examiner Name	Unknown
Group / Art Unit	Unknown
Attorney Docket No.	60,437-016

METHOD OF PAYMENT (check all that apply)

☒ Check ☐ Credit Card ☐ Money Order ☐ Other
☐ Deposit Account ☐ None

Deposit Account Number: 08-2789

Deposit Account Name: Howard & Howard

The Director is authorized to: (check all that apply)
☐ Charge fee(s) indicated below ☐ Credit any overpayments
☒ Charge any additional fee(s) during the pendency of this application
☐ Charge fee(s) indicated below, except for the filing fee to the above identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	160

SUBTOTAL (1) ($) 160

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims		-20** =	0	X		=	0
Independent Claims		-3** =	0	X		=	0
Multiple Dependent				X		=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	200	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *exparte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,330	2453	665	Petition to revive – unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
Other fee (specify)					

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 0

SUBMITTED BY

Name (Print/Type)	Gregory D. DeGrazia	Registration No. Attorney/Agent	48,944	Telephone	248.723.0325
Signature				Date	2-13-04

Complete *(if applicable)*

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LIGHT WEIGHT NOISE ABSORPTION SYSTEM

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LIGHT WEIGHT NOISE ABSORPTION SYSTEM

BACKGROUND OF THE INVENTION

[00001] In the increasing competitive vehicle market, vehicle manufacturers have strived to reduce the amount of noise transmitted into the passenger compartment from both the road and the engine powering the vehicle. The most common method of stopping this noise transmission is through the addition of high mass sound deadeners affixed to both the floor pan, and the fire wall separating the passenger compartment from the engine compartment. The historical problem with this strategy is that these noise dampeners add a significant amount of mass to the vehicle which reduces the average miles per gallon rating of the vehicle.

[00002] The primary method of blocking noise transmission from the engine compartment into the passenger compartment is through the installation of an interior dash mat that is generally positioned between the instrument panel and the firewall of the vehicle. These dash mats have primarily been manufactured from a layer of urethane foam that is laminated to a heavy plastic or rubber barrier. The urethane foam abuts the firewall to absorb vibrational noise from the firewall. However, the heavy plastic or rubber barrier prevents most of the noise transmitted from the engine compartment from reaching the passenger compartment by blocking the transmission of sound.

[00003] This type of interior dash mat has provided adequate noise reduction in the passenger compartment but has presented many drawbacks. First, this dash mat adds a significant amount of mass to the vehicle. Second, a dash mat typically covers the entire firewall and toe pan area of the floor plan. Due to the size and mass of

the dash mat, it is very difficult to install in an accurate location within the vehicle. The installation process has required various types of fastening devices including, weld studs, insertion fasteners, and clips. Occasionally, the dash mat is attached first to the instrument panel prior to installing the instrument panel into the vehicle, which has resulted in installation problems with the instrument panel. In an effort to reduce the mass of these interior dash mats, light weight materials have been undergoing development, but have not yet obtained wide scale acceptance in the automotive industry.

[00004] One such low mass dash mat that has been experimented with is formed from a dual density cotton. A first layer cotton having a first density and a second layer of cotton having a second density is laminated using adhesives along with a third layer of an airflow film to prevent the flow of air through the dash mat is attached. Preventing the flow of air through the dual density cotton is required just to approach near the amount of noise reduction achieved by conventional dash mats. An alternative to cotton has also been attempted using a dual density polyester. In this type of dash mat, a first layer of polyester having a first density and a second layer of polyester having a second density is laminated and an airflow film is also attached to prevent the flow of air through the dash mat.

[00005] These new types of dash mats have proven to be lighter than conventional dash mats, and it is believed further mass savings can still be achieved. Additionally, it is believed that the noise reduction achieved by these new types of dash mats can still be improved upon. Therefore, it would be desirable to provide an interior dash mat providing still further mass savings while increasing the amount of noise reduction presently achieved.

SUMMARY OF THE INVENTION AND ADVANTAGES

[00006] A noise absorption assembly includes a first layer of material and a second layer of material. The second layer of material has a greater density than the first layer of material. The first layer of material is formed from a fibrous polyester and a second layer of material is formed from a non-woven blend of polyester and rayon.

[00007] The inventive noise absorption assembly provides noise absorption benefits not previously provided by prior art absorption assemblies. The use of a double layer of polyester/polyester rayon laminate provides even a lower mass absorption assembly than does the double density cotton assemblies of the prior art. Furthermore, the inventive assembly provides improved noise reduction over the dual density cotton absorption at even lower mass. A table showing a comparison between the random incidents sound absorption co-efficients and a frequency in hertz is represented in Figure 1, which indicates the inventive assembly meets all of the noise reduction requirements set forth by OEM vehicle manufacturers.

BRIEF DESCRIPTION OF THE DRAWINGS

[00008] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[00009] Figure 1 shows a scatter graph of a sound absorption co-efficient relative to the frequency of noise as produced by the inventive assembly;

[00010] Figure 2 is a partial cross-sectional view of the inventive assembly; and

[00011] Figure 3 shows a perspective view of an inventive assembly configured as an interior dash mat.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[00012] Referring to the Figures, wherein like numerals indicate like or corresponding parts throughout the several views, a sectional view of a noise absorption assembly is generally shown at 10 in Figure 2. The noise absorption assembly is generally used to reduce the level of noise transmitted into a passenger compartment of a vehicle from either the road or the engine through a floor pan (not shown) or a firewall (not shown) respectively of a motor vehicle. A first layer of material 12 is formed from a fibrous polyester having a density of generally 49 grams per square foot. The first layer of material 12 is formed from a sheet or bun of polyester having a thickness of generally between 25 and 30 millimeters. The polyester component of the first layer of material 12 preferably includes first and second polyester fibers. A first polyester fiber includes a melting point that is greater than the second polyester fiber, the purpose of which will be explained further below. A second layer of material 14 is laminated to the first layer of material 12 and is formed from a rayon and polyester blend. The second layer of material 14 has a greater areal-mass than the first layer of material 12, which is generally between 90 and 110 grams per square meter. The second layer of material 14 includes an air flow resistivity of between generally 700 and 800 Rnm^{-3}. The areal-mass of the second layer of material 14 is preferably between generally 0.08 kg/m^2 and 0.17 kg/m^2, and more preferably generally 0.1kg/m^2. The second layer of material is formed as a non-woven fabric to prevent or significantly reduce the amount of air flow capable of passing through the assembly 10. Therefore, the second layer of material 14 functions as an acoustical membrane to absorb noise transmitted into the passenger compartment. This differs from prior art barriers that utilize a plastic/rubber barrier to block the sound transmission into the passenger compartment at a significantly higher mass.

[00013] Preferably, a scrim 16 is adhered to the second layer of material to provide additional durability to the assembly 10. Alternatively, a scrim 16 may also be applied to the first layer of material 12 or only to the first layer of material 12.

[00014] Referring now to Figure 3, the assembly 10 is shown as being formed into an interior dash mat 18. The dash mat 18 takes a 3 dimensional configuration to fit the contours of the firewall of the motor vehicle. Various apertures 20 are cut into the dash mat 18 with either a water jet or piercing tool to provide access for various components passing through the fire wall from the engine compartment to the interior. In some instances, the thickness of the dash mat needs to be compressed due to the limited the packaging space available in the passenger compartment. In these areas such as indicated by element no. 22, the thickness of the first layer of material 12 is compressed from the original 20 to 30 millimeters thickness. This also provides rigidity to the dash mat 18. Furthermore, ribs 24 may also be formed into the dash mat 18 providing additional rigidity where necessary.

[00015] When forming the assembly 10 into a dash mat 18, a sheet of material comprising the first layer of material 12, a second layer of material 14 and a scrim 16 is heated to a temperature capable of melting the low melt temperature polyester fibers while not melting any of the other fibers in the assembly 10. Subsequent to heating the assembly 10 to this desired temperature, the sheet of material is thermoformed to the desired three-dimensional configuration. After the forming process, the assembly 10 is chilled so that the melted polyester fibers solidify holding the assembly 10 in the desired three-dimensional configuration and maintaining the first layer of material 12 in a desired loft. Furthermore, the melted polyester fibers also bond to the second layer of material and the scrim to form the laminate. Subsequent to molding, the apertures 20 and trim line of the assembly 10 is cut by either water jet or piercing to form the finished dash mat 18.

[00016] Due to the light weight of the finished dash mat 18, conventional fastening methods such as weld studs or push in fasteners are not necessary. Adhesive 26 is applied at spaced locations around the dash mat 18 to adhere the dash mat 18 to the fire wall. This provides a simplified method of installing the dash mat 18 into the motor vehicle that is not available to heavier/conventional dash mats.

[00017] A significant amount of testing has been conducted to verify the feasibility of using this assembly 10 in an automotive environment. This test data is included in Table 1.

[00018] The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

[00019] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, wherein reference numerals are merely for convenience and are not to be in any way limiting, the invention may be practiced otherwise than as specifically described.

CLAIMS

What is claimed is:

1. A noise absorption assembly, comprising a first layer of material and a second layer of material having a density greater than said first layer of material, and wherein said first layer of material comprises fibrous polyester and said second layer of material comprises a non-woven blend of polyester and rayon.

2. An assembly as set forth in claim 1, wherein said first layer of material comprises a density of between generally 40 g/ft^3 and 60 g/ft^3.

3. An assembly as set forth in claim 1, wherein said second layer of material comprises a density of between generally 90 g/m^3 and 110g/m^3.

4. An assembly as set forth in claim 1, wherein said first layer comprises a blend of first and second polyester fibers.

5. An assembly as set forth in claim 4, wherein said first polyester fiber comprises a lower melting temperature than said second polyester fiber.

6. An assembly as set forth in claim 5, wherein said assembly is formable into a predetermined three dimensional configuration by melting said first polyester layer.

7. An assembly as set forth in claim 5, wherein said first polyester layer adheres to said second layer of material thereby laminating said first layer of material to said second layer of material.

8. An assembly as set forth in claim 1, wherein said first layer of material comprises a generally imperforate barrier thereby reducing air flow through said assembly.

9. An assembly as set forth in claim 1, further including a scrim affixed to at lease one of said first layer of material and said second layer of material.

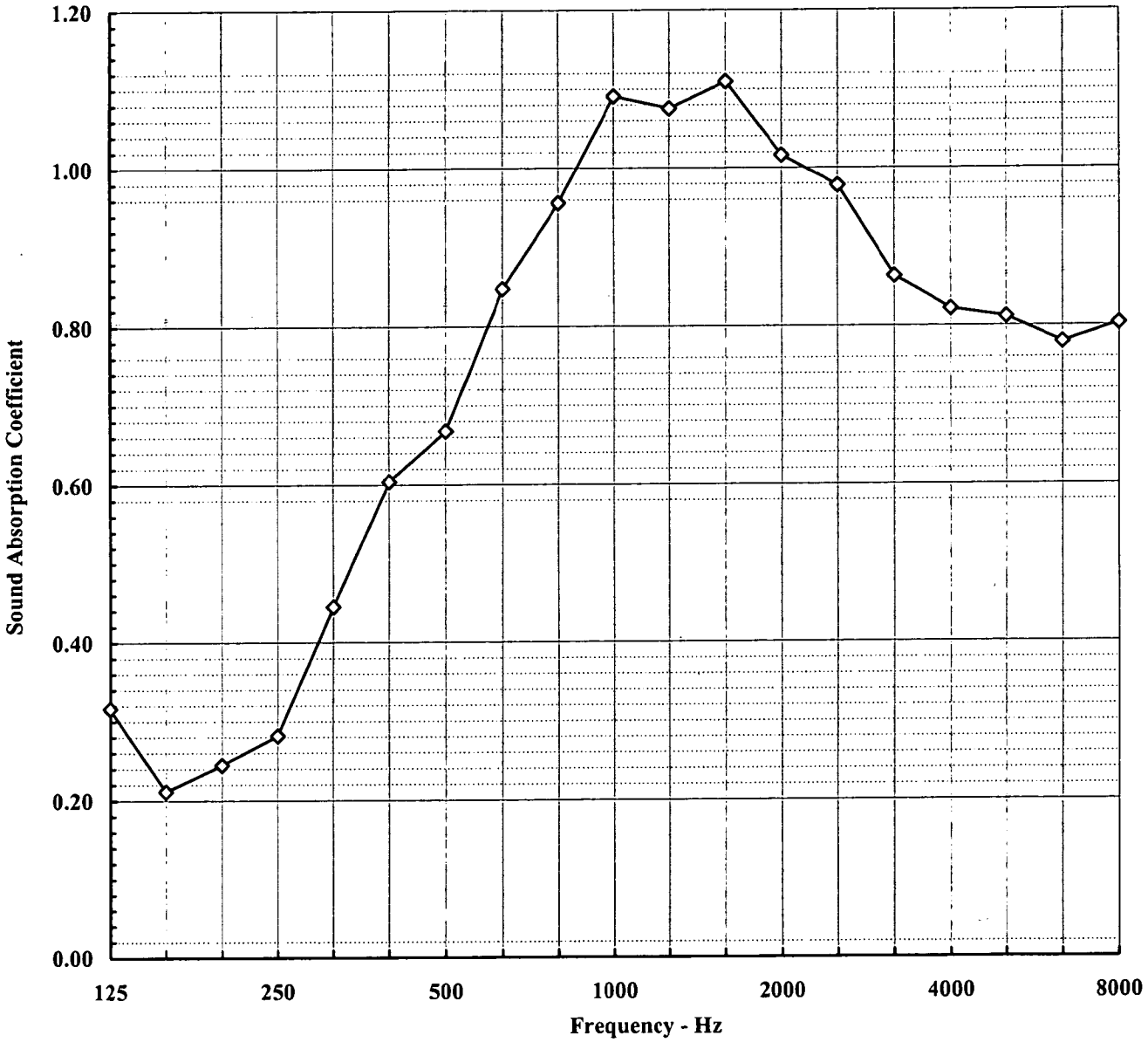
10. An assembly as set forth in claim 9, further including contours formed into said first layer of material thereby providing strengthening features to said assembly.

ABSTRACT OF THE DISCLOSURE

[00020] A noise absorption assembly includes a first layer of material and a second layer of material having a density greater than said first layer of material. The first layer of material is formed from fibrous polyester and the second layer of material is formed from a non-woven blend of polyester and rayon.

COMPARISON OF RANDOM INCIDENCE SOUND ABSORPTION COEFFICIENTS

Test Conducted for: **BBi Enterprises, Inc.**



S5: 100 g/m^2 facing, 45 g/ft^2 PET
Meas. Data ; Thickness: 27 mm, Surface Wt.: 0.70 kg/m^2, Denstiy: 25 kg/m^3; NRC = 0.75

Figure 1

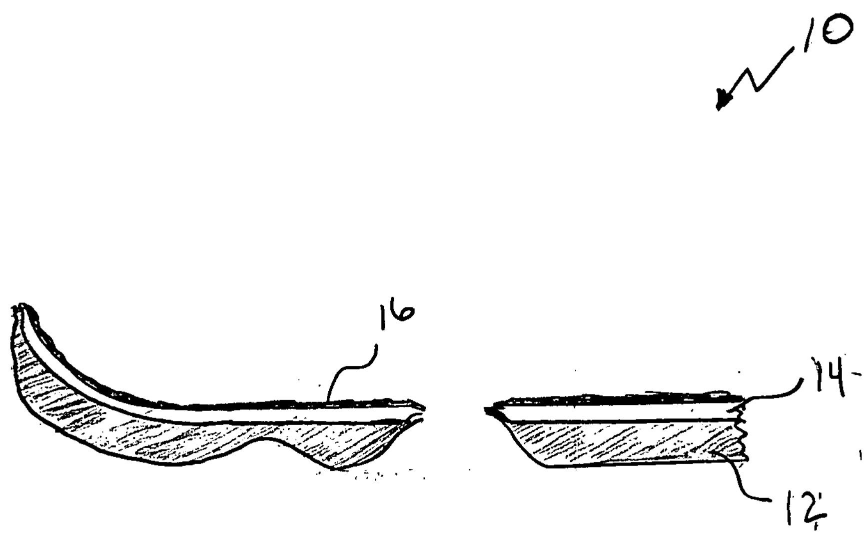


Figure 2

Tape locations are in black

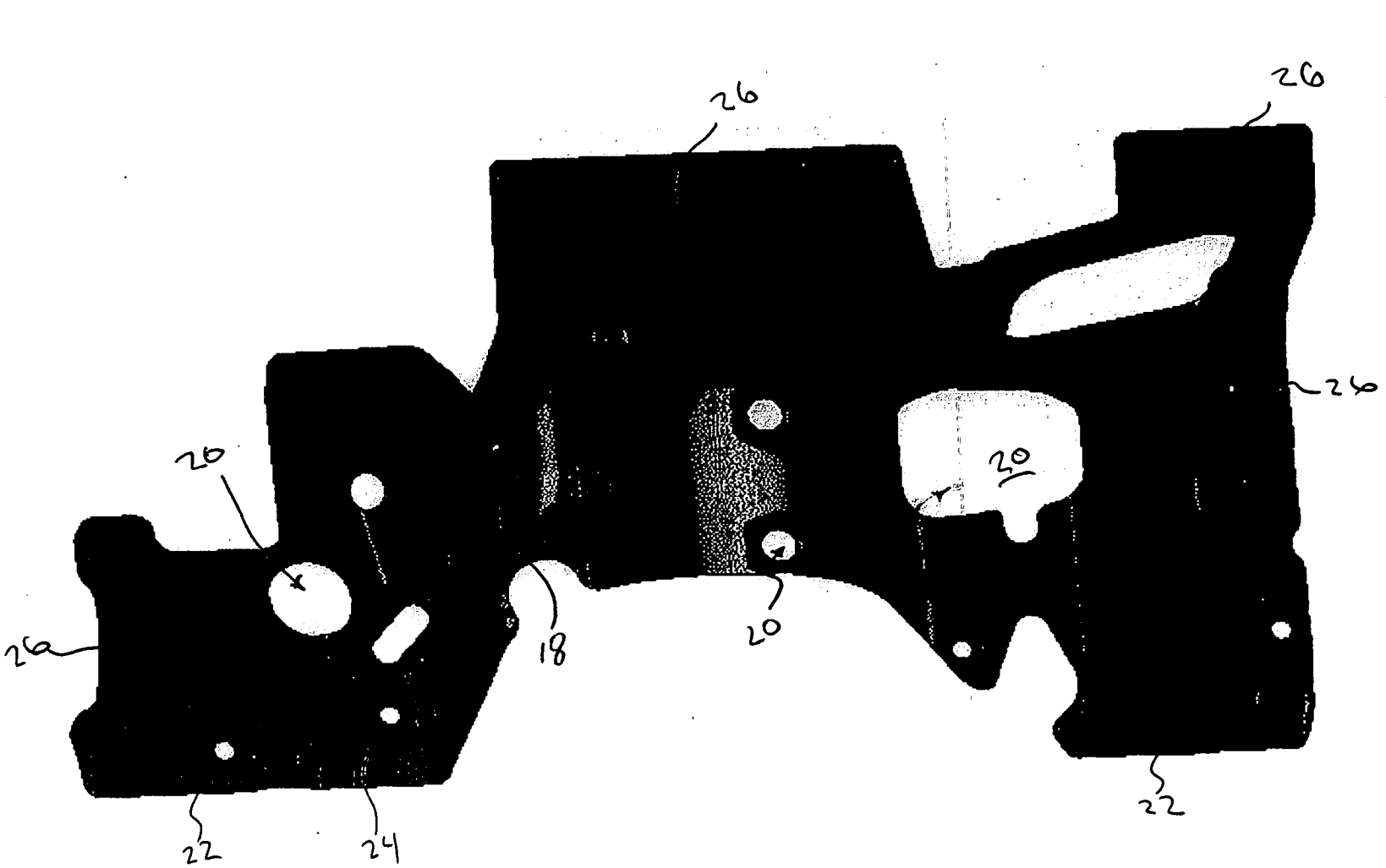


Figure 3